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Report from the Coalition Battle Management Language Study Group

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Monterey, California: Naval Postgraduate School

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Report from the Coalition Battle Management Language Study Group

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Coalition Battle Management Language (C-BML Study Group)

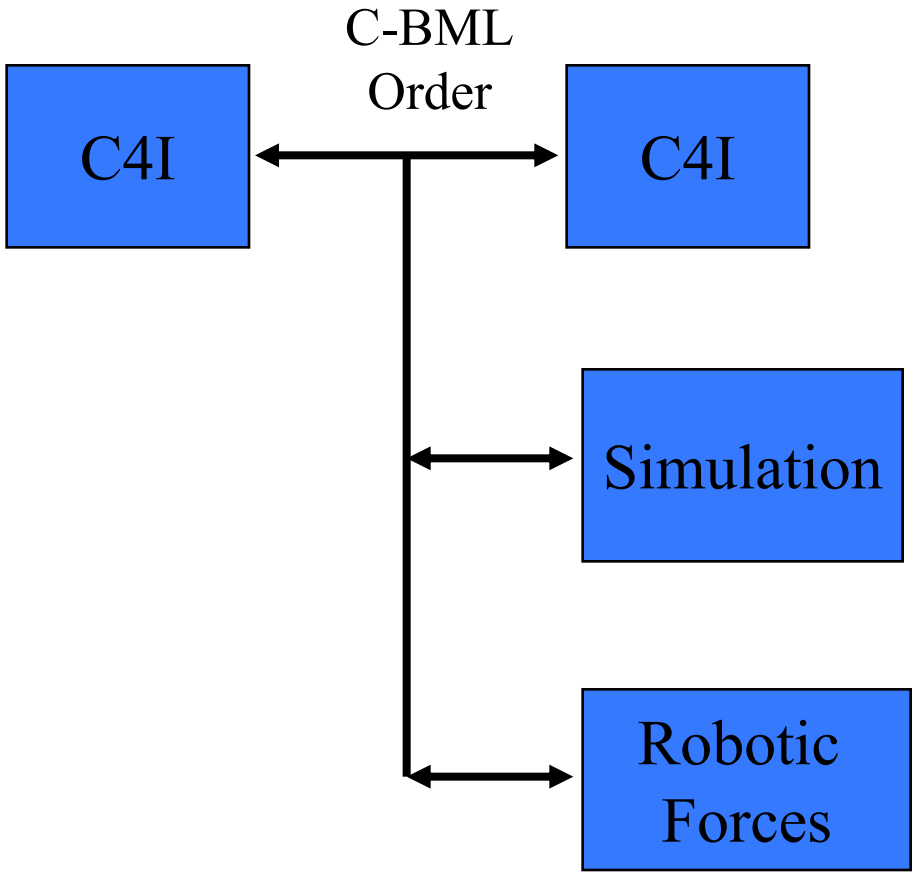
- C-BML Study Group built on the foundation of previous SISO study groups
  - C4I Study Group
  - C4ISR/TRM Study Group

- C-BML Leverages existing bodies of work
  - CCSIL (Command and Control Simulation Interchange Language)
  - C2IEDM (Command and Control Information Exchange Data Model)
  - US Army SIMCI OIPT BML (Simulation to C4I Interoperability Overarching Integrated Product Team)
  - French Armed Services APLET BML
  - US/GE SINCE BML (Simulation and C2IS Connectivity Experiment)

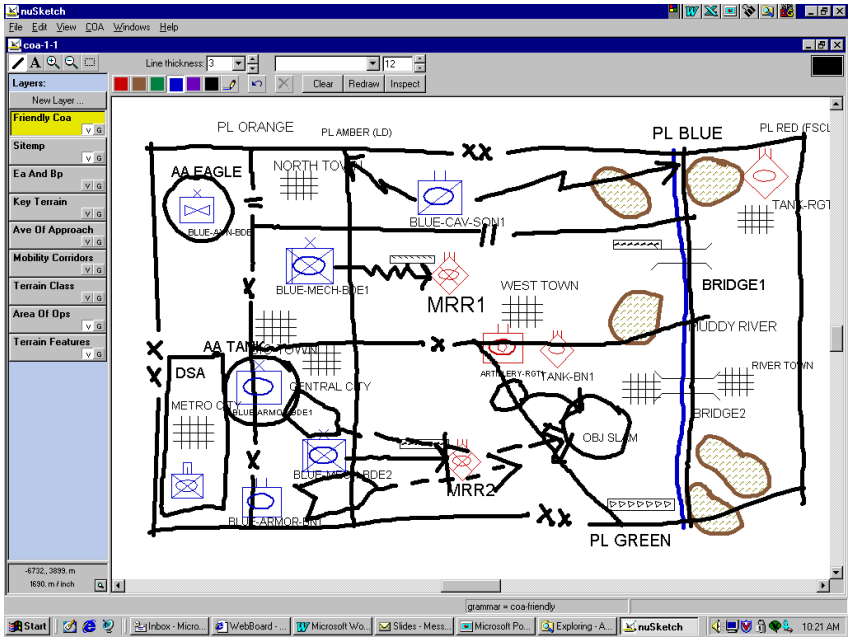
C-BML Scope

C-BML will provide a capability to:

- Convey orders and commands to live, simulated, and robotic forces
- Convey situational awareness



C-BML Concept



Division Mission

Division attacks on order in zone to seize OBJ SLAM

Division Concept of Operations

Form of maneuver: Penetration
Main effort: BLUE-MECH-BDE2,
on order BLUE-ARMOR-BDE1
Supporting effort: BLUE-MECH-BDE1
BLUE-ARMOR-BN1
Deep: None
Reserve: BLUE-AVN-BDE1
Security: BLUE-CAV-SQN1
Tactical Combat Force: BLUE-MECH-TM1

Tasks to Subordinates

Who	What	When	Where	Why
BLUE-MECH-BDE1	Attacks	On order	Zone	Fix (MRR1)
BLUE-MECH-BDE2	Attacks	On order	Zone	Penetrate (MRR2)
BLUE-ARMOR-BDE1	Follows and Assumes (B-M-BDE2)	On order	Zone	Seize (OBJ SLAM)
BLUE-AVN-BDE	Occupy	On order	AA EAGLE	Reserve
BLUE-ARMOR-BN1	Follow and Support (B-A-BDE1)	On order	Zone	Support (B-A-BDE1)
BLUE-CAV-SQN1	Screen	On order	Zone (PL AMBER to PL BLUE)	Protect (Division left flank)
BLUE-MECH-TM1	Tactical Combat Force	On order	DSA	Protect (Division Rear Area)

Commander's Intent – The Mission of the C-BML SG

Designed to facilitate C2 to Simulation Interoperability

Uses *de facto* international standard (C2IEDM) for C2 in C-BML Development

- Recommended for C3I to M&S interoperability at the NATO Research and Technology Organization (RTO) Modelling and Simulation Interoperability Conference MSG-022 in Turkey (October, 2003)
- Recommended for C2 to M&S interoperability by the US Army M&S Executive Council (July, 2005)

C-BML SG Activities

C-BML SG approved by SISO in September, 2004

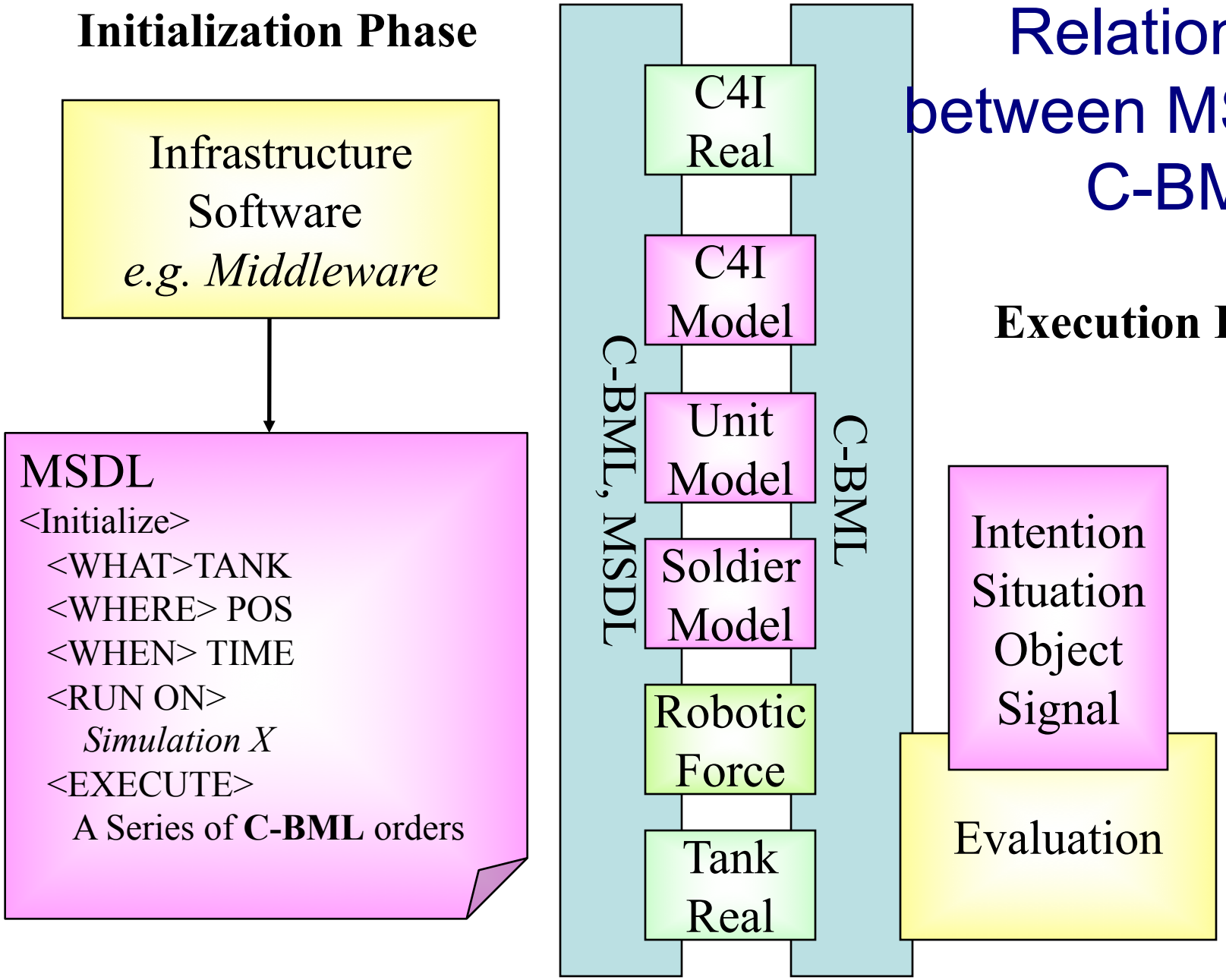
Participants represent a wide body of expertise, including:

- Representatives from over 11 different nations
- Over 100 participants at SG meetings
- Industry, Academia, Government

Numerous SG meetings and workshops (outside of SIW meetings) have been conducted, with robust activity

Active coordination with Military Scenario Definition Language (MSDL) SG has brought about harmonization of plans with their future Product Development Group (PDG)

Relationship between MSDL and C-BML



C-BML SG Terms of Reference

- The study group shall conduct a survey comprising as many international contributions applicable to the C-BML effort as possible
- The study group shall develop a plan of how these various efforts identified in Task 1 can contribute to a common C-BML standard/standard framework
- The study group shall formulate a set of recommendations for a C-BML Product Development Group

Survey of C-BML Initiatives

- As part of the C-BML Study Group effort, 18 related initiatives were identified
- The information for each of these Initiatives was supplied by a Point of Contact for the effort and consisted of a three part submission including:

  Problem Statement

  Solution Proposed

  C-BML Relevance

- The following slides briefly describe these 18 projects and identify potential areas of relevance for C-BML

Relevant Initiatives (1 of 4)

1. ABACUS Architecture (Raytheon, USA) – *Use of BML in a UK Command and Control Staff Trainer*
2. Aide a la Planification d'Engagement Tactique (APLET) (DGA/EADS, France) – *Innovative Army C2IEDM BML Work*
3. Army C4ISR and Simulation Initialization System (ARL/UT, USA) – *Use of BML to initialize Army Systems*
4. Base Object Model (BOM) PDG (SimVentions, USA) – *Identify relationship of BML to emerging SISO Standard*
5. C2 Ontology (VMASC/ODU, Norfolk, Virginia, USA) – *Derivation of an Ontology from the C2IEDM for BML Development*

Relevant Initiatives (2 of 4)

7. EXPLAIN Project (North Side, Inc., Canada) – *Natural Language Parsing with BML*
8. Formal Tasking Language Grammar (Mitre, USA) – *Development of a Formal Grammar for BML*
9. Geospatial BML (US Army Engineer Research and Development Center, USA) – *Use of BML for representing missions to support Terrain Analysis*
10. Identification of C-BML Need (Ericsson, Sweden) – *Identifies four areas where BML can be applied*
11. Intelligence Modeling and Simulation for Evaluation Scenario Generation Tool (US Army Threat System Management Office, USA) – *Application of BML in a Scenario Generation Tool for Testing C4I Systems*

Relevant Initiatives (3 of 4)

12. NATO C-BML Exploratory Team (NATO RTA) – *Complementary effort in NATO to develop a C-BML capability and evaluate its use*
13. Shared Operational Picture Exchange Services (DMSO, USA) – *Use of C2IEDM and BML in the Object Management Group Initiative for a Shared Operational Picture*
14. Simulation to Command and Control Information System Connectivity Experiments (Atlantic Consulting Services, USA) – *German/US project using BML to explore collaborative C2 concepts in a Coalition Environment*
15. SOKRATES (FGAN-FKIE, Germany) – *Automatic Report Analysis System using Natural Language Processing based on representations from the C2IEDM*

Relevant Initiatives (4 of 4)

16. Task Analysis Leading to BML Vocabulary (AcuSoft, USA) – *Researching how an Order/Task can be represented across the doctrine of a coalition*
17. UK Research into BML (QinetiQ, UK) – *Assessment of US Army BML Prototype and resulting recommendations for UK Development*
18. XML-based Tactical Language Research (Naval Postgraduate School, USA) – *Information Representation based on the C2IEDM and XML for Nine Projects including Autonomous Unmanned Vehicle (AUV) Workbench, using an Autonomous Vehicle Control Language (AVCL)*

C-BML Product Development

Goal: Develop, in phased versions, a C-BML standard that will facilitate interoperability between C2 and M&S

Each version will include:

- Data Model
- Content Schema
- Exchange Mechanism
- Implementation Guidelines

The phased versions will include each of these aspects in increasing levels of detail and refinement

Phased Development for C-BML

1st Standard (2007)

- C-BML expressed in C2IEDM, initial versions of Data Model, Content Schema, and Exchange Mechanism
- Implementation Guidelines

2nd Standard (2008)

- C-BML Formal Grammar based on Phase 1 Semantics and relationships
- Implementation Guidelines

3rd Standard (2010)

- C-BML Ontology based on Phase 1 Semantics and Phase 2 Grammar
- Implementation Guidelines

C-BML in the C2IEDM

References from Literature Survey:

Turnitsa, C., Kovurri, S., Tolk, A., DeMasi, L., Dobbs, V., Sudnikovich, W., "Lessons Learned from C2IEDM Mappings Within XBML," Paper 04F-SIW-111, Simulation Interoperability Standards Organization, Fall 2004 Simulation Interoperability Workshop, Orlando, FL, September.

- *Technical report on using the Coalition data model, the C2IEDM, to represent BML.*

DeMasi, L., Dobbs, V. S., Ritchie, A. and Sudnikovich, W. P., "Implementing Battle Management Language: A Case Study Using the Command and Control Information Exchange Data Model and C4I-M&S Reference Object Model," Paper 05S-SIW-068, Simulation Interoperability Standards Organization, Spring 2005 Simulation Interoperability Workshop, San Diego, CA, April.

- *Work in structuring BML in the C2IEDM using the 5 Ws.*

Tolk, A., Diallo, S., Dupigny, K., Sun, B. and Turnitsa, C., "Web Services based on the C2IEDM – Data Mediation and Data Storage," Paper 05S-SIW-019, Simulation Interoperability Standards Organization, Spring 2005 Simulation Interoperability Workshop, San Diego, CA, April.

- *Paper detailing how the XBML work can be standardized further in the area of prototols with C2IEDM Web Services*

A Grammar for C-BML

In principle, production rules for **C-BML basic phrases** could have the following form:

S → Action Tasker Taskee (Affected) (Material) (Where) (Start-When) (End-When) Why (How)

"Action" is an action or task;
"Tasker" is a "Who", the unit which commands the task;
"Taskee" is a "Who", the unit which executes the task;
"Affected" is a "Who", the unit which is affected by the task;
"Material" is equipment which is involved in the task;
"Where" is a "location phrase";
"When's are "time phrases";
"Why" is a terminal symbol giving the purpose of the action;
"How" is a decomposition of the basic phrase into other basic phrases.

C-BML Ontologies

References from Literature Survey:

Tolk, A., and Blais, C., "Taxonomies, Ontologies, and Battle Management Languages – Recommendations for the Coalition BML Study Group," Paper 05S-SIW-007, Simulation Interoperability Standards Organization, Spring 2005 Simulation Interoperability Workshop, San Diego, CA, April.

- *Paper giving specific recommendations for C-BML development within SISO.*

Turnitsa, C., and Tolk, A., "Evaluation of the C2IEDM as an Interoperability-Enabling Ontology," Paper 05F-SIW-084, Simulation Interoperability Standards Organization, Fall 2005 Simulation Interoperability Workshop, Orlando, FL, April.

- *Paper evaluating the C2IEDM to determine how it meets evaluation criteria for ontologies.*

C-BML SG Recommendations

- SISO accept the Product Nomination
- SISO establish a C-BML PDG
- A phased approach be taken for development of the standard
- The C-BML PDG be separate from a proposed MSDL PDG
  - C-BML focuses on C2/M&S data interchange
  - MSDL focuses on simulation initialization
- C-BML and MSDL PDGs collaborate on areas of common interest
- Maintain engagement with C2 community to ensure joint ownership and development of the standard

Last C-BML SG Meeting!

Thursday - 0800-1200
in Sanibel

Followed by the MSDL SG Meeting in the afternoon

Backup

HLA Opportunity in Phase 1 C–BML: C2IEDM and BOMs

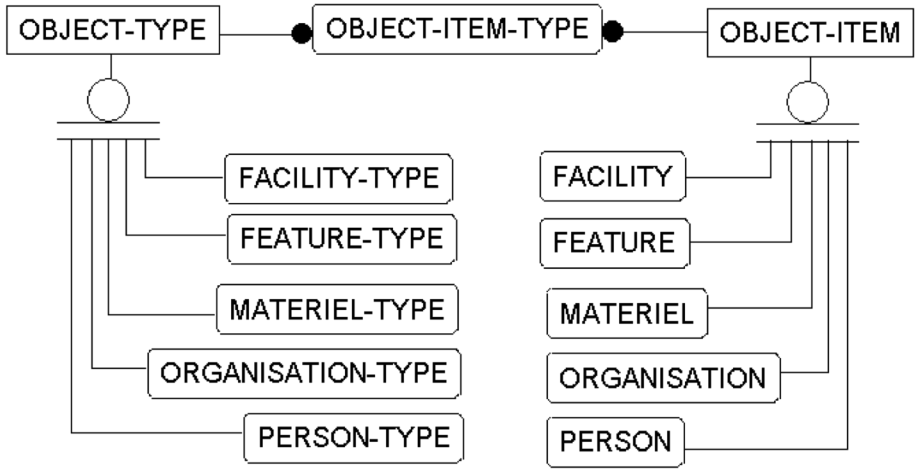
Difficult to represent C2IEDM in HLA –

Opportunity to partition C2IEDM into BOMs

- Exploit BOM Conceptual Model Capability
- Define BOM Object Model Definitions (HLA OMT constructs)
- Results in reusable C2IEDM mappings
- Leverage BOMs to create BOM Assembly
- Use BOM Assemblies to generate FOMs

Could Explore / Test with an initial Use Case

- **C2 Reports**
  (Input C2IEDM Spot Reports to Sim)
- **C2 Orders**
  (Compose C2IEDM/C-BML Orders for Sim)
- **Initialization**
  (Initialize Sim using Scenario data from C2IEDM and MSDL)



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FOCUS ON FUNDAMENTAL ELEMENTS OF THE BATTLEFIELD

- **Facility, Feature, Materiel, Organization, Person**
- **Representation both generic (by class) and specific (by item)**
- **Location and geometry**
- **Relationships between items (e.g., unit to unit)**
- **Activities**

FOCUS ON BATTLEFIELD ACTIVITY

- **Objects serve as resources and objectives: "Use these objects against these objects this way"**
- **Represents Events, Plans, Orders, and Requests**
- **Activities can be grouped and structured to specify sub-activities, modifications, and (time) dependence**

BOMs are a natural way to package C2IEDM "functionality" for HLA environments

C-BML and MSDL Capabilities

C-BML Capabilities	Common Capabilities	MSDL Capabilities
• Unambiguous language for orders, reports, and situational awareness. • Used to communicate between humans, robotics, and simulations within and between echelons. • Leverages common tasking language grammar developed by MSDL & BML participants. • Supports all phases of military operations: planning, execution, and review. • Supports multiple doctrines. • Provides a standard data representation using the C2IEDM. • Provides an unambiguous vocabulary across the international C4I domain. • Includes a reference implementation and recommended practices for message distribution.	• Support for simulation pre-initialization phase (operational planning phase). • Common tasking language grammar shared between MSDL & BML allows for consistent data interchange for simulation initialization. • Common vocabulary across the international C4I domain. • Supports multiple doctrines.	• Unambiguous language to represent military scenario data and file transmittal format for simulation initialization. • Provides military scenario information that is simulation independent in format and content. • Leverages common tasking language grammar developed by MSDL & BML participants. • Supports activities leading up to the simulation initialization phase. • Supports multiple doctrines. • Provides a standard interchange representation using XML. • Leverages C-BML vocabulary across the international C4I domain. • Includes a reference implementation.